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ABSTRACT

Presented in this document are two papers by the same author which deal with various aspects of the role of vocational-technical teachers as change agents. The first paper focuses on the cost-effectiveness of investments to train teachers to help students evaluate their environment critically from the standpoint of determining the changes that are needed and bringing them about. Teachers can become effective agents in the area of changing costs if (1) they are trained in close contact with industry, (2) they are helped to develop more positive social attitudes and an orientation toward participation in social change, (3) environmental education is made an integral part of the entire vocational curriculum, (4) they are trained to require quality, and (5) they are themselves trained in the use of appropriate technology. The second paper (untitled) discusses the pros and cons of various types of educational "software" (described here as including teachers, students, print material, libraries, and computer software). Particular attention is paid to the needs of educators and students in Southeast Asia and the South Pacific, with emphasis on the need to train local teachers in using libraries, developing their own course materials and lecture notes (in particular, developing them from English materials when necessary), and using microcomputers and computer software (in the conventional sense of the word). Special note is taken of the success that the Colombo Plan Staff College for Technician Education in Manila has had in developing instructional materials and sharing them with other schools in the area. (MN)

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REGIONAL WORKSHOP

ON

TECHNICAL/VOCATIONAL TEACHER TRAINING

(11-22 May 1987 : Chiba City, Japan)

ROLE OF TECHNICAL/VOCATIONAL TEACHERS AS 'CHANGE AGENTS'

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REGIONAL WORKSHOP ON TECHNICAL/VOCATIONAL TEACHER TRAINING

ROLE OF TECHNICAL/VOCATIONAL TEACHERS
AS 'CHANGE AGENTS'

ROBERT McCAIG

This paper is circulated as submitted by the author. The views expressed are those of the author and do not reflect the policies of the organizers of the Workshop.

REGIONAL WORKSHOP ON TECHNICAL TEACHER TRAINING
Chiba City, Japan 11-12 May, 1987
ADB, Government of Japan and APSDP

C.4.1 Within the Context of Cost-effective Training Schemes -
The Role of Teacher/Vocational Teachers as Change Agents

Robert McCaig*

The work life of a teacher is from thirty to forty years. If the teacher trainer can imbue each of the generations of students he trains with the need to critically evaluate environment and to examine it in relation to bringing about needed changes, the impact is immense. Any investment in the teacher trainer who can succeed in producing such a multiplier effect must be cost effective, irrespective of initial investment costs. This is the first point which needs to be stressed. One needs to have a wider perspective on training costs than the annual budget. Very high initial investment must be seen as amortizing over many years. We apply this principle already to buildings and equipment but regrettably not yet to the major resource, the training personnel.

The second point is that though there has never been a shortage of talk on intention about creating educational environments for change this has not been matched by the development of appropriate organizational environments and strategies for its practice. This workshop must therefore be assumed to be future oriented, even perhaps with a measure of idealism, since at the present time the opportunities for and the potential of teachers to be change agents in their area of expertise is small. The role they could and should play is considerable. The technicians, using the word in its broadest sense, covering the kinds of services they are able to give, from factory and farm through to partnership with scientists in the most sophisticated of laboratories, can play a key role in innovation and change.

The current impediments to such levels of involvement are culturally and socially determined and, as such, need to be considered with great tact and care. Nations are proud of their culture and traditions which inevitably control human behaviour. New nations are particularly proud. The main problems many nations face is the reconciliation of what they would like to be in an economic sense with what sacrifices of traditional and social values they are willing to make in order to achieve economic goals. It could be that social and cultural values can coincide, or be made to coincide with economic goals. Our host, Japan, seems to be a happy amalgam of the two. Other nations are "reinterpreting" their traditional values, often very skilfully, to permit rapid technological progress.

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Next one needs to look at the circumstances which engender and encourage change. If we go to the extreme and take creativity as the highest level of change, this being also what most educators mean when they talk about change, then the circumstances leading to this have been well documented. Most of us are familiar with the Silicon Valley type of industry in the United States and with the revolutionary changes which have taken place in the computer industry. The history of the Apple Computer company is well known and it illustrates particularly well the dangers and the benefits of change.

In that particular culture the kind of person industry is seeking for creative tasks is not the kind we would normally employ in a typical Asian organization, and particularly in a government controlled training institution. He would be regarded as a disruptive element, a bad influence, as a non-productive employee. As one aspect of the employee's profile the employer would be looking for evidence of genuine non-conformity - a person who does not fit in easily with the group, who questions and probes and who is not satisfied until he teases out explanations to his own satisfaction. He may not necessarily have any high academic qualifications or indeed have any social graces.

Organizations seeking out such employees must also be different. They have to encourage non-conformity on the part of employees. Adherence to rigid working hours, tidy desks and offices, neat appearance, being a good solid member of a team - all are things which would not be sought. It would encourage the employee to daydream, to come and go at will, to argue and debate with other employees. It might encourage team work but not with the idea of creating a state of harmony where all push in unison, but a place where people agree to disagree, to clash intellectually because out of this come the sparks of new ideas.

This is a far cry from the way we train technicians today; it is a far cry from the way I run my own office. It may not even be an attainable or desirable goal in the immediate future since it can only work in a very particular kind of social climate where trust is strong, where long-term perspectives are necessary, where the taking of risks and hence the making of mistakes is regarded as necessary. The rewards in terms of technological development can be spectacular; the risks and the costs can be equally so.

Because of cultural and political attitudes in this region we are not likely to pay this kind of price or run this kind of risk. Failure is not something which is accepted easily and this possibility is always about when change is the objective. So far, in some countries in the region there has been a recognition of the need for such an approach and indeed partial experiments in that direction. Think tanks have been set up with the idea of their being creative but the area of permitted creativity has

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been severely restricted - restricted to the discovery of new technological breakthroughs. Whether the creative intellect can be applied sectionally to technological issues while remaining strictly conformist on all other aspects of thinking is an issue which only the test of time will show. I was once asked to explain corporate planning to the faculty of a polytechnic department. Corporate planning is an organizational response to development of change strategies. The department had been asked, maybe even told, to introduce corporate planning. As I explained the elements and the philosophy of corporate planning and the specifications for its success the faces of my audience became more and more strained. It became clear to them that there was no way for them to undertake corporate planning since the constraints under which they operated were numerous and the freedoms few. At best if they arrived at any bright idea their superiors might consider it. Pseudo measures to give lip service to change can be disillusioning and destructive of morale. Unless there is a genuine belief it is doubtful if there are benefits to be derived from nominal attempts at it.

I took this extreme case of creativity because the elements in it apply in varying degrees at all levels of change and change strategy. Change is not easy or simple. It hurts and threatens people even in a workshop environment. It alters statuses and upsets organizations. It is uncomfortable for most of us. When you talk about change it must also be in the context of the assessment of risks and of social costs associated with it. Even the smallest changes trigger opposing reactions. Change must never be just for others; as leaders change must start with us and so current education must be prepared to draw up their own score sheet outlining what risks and what concessions they are willing to make in order to encourage change.

In the context of Section C, tying change to cost, there are areas where technical and vocational teachers can be change agents, given a sympathetic environment and adequate resources. The main resources do not relate to money but background training that creates appropriate attitudes and values.

One such area, and the key one, is how to improve industry. The assumption is that industry will be changed by having technicians within the organization as the change agents. The technician has both a maintenance and a creative function. This will be possible only if a closer, healthier partnership is established by the training institutions with industry. As the training institution is the service organization the major initiative must be with it to seek out better ways of working with industry. Educationists associated with technician education have shielded themselves far too long from industry; industry's contribution has been minimal and usually poorly regarded. Educators have a very valid point in requiring of technicians a good conceptual base, an educational component as well as a training component. They, too, will be the ones to

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inculcate the attitudes to change that have been referred to. If one is looking at cost effective training schemes, however, and particularly at long term economic developments, both educational and training needs need to be addressed cooperatively by educators and industrialists as full partners. Most systems have some links with industry but many are educationally unsound and from an industry standpoint far from effective. Some amount not to training but to the exploitation of the student in cheap labour, repetitive situations and hence, from the educator's perspective, a high cost/low educational gain activity. There are several successful models of appropriate cooperation in the region. The Colombo Plan Staff College is publishing a book of case studies describing some of them. A change on the part of educationists to pursue a more aggressive policy for cooperation with industry in developing more integrated education/training programmes is perhaps one of the simplest ways of addressing the cost issues associated with long term effective training. Such positive industry education institution environments welcome, and in fact seek out, ideas for change.

A second broad area concerns going beyond training in skills to the development of more positive social attitudes and to an orientation to participation in social change. I refer to the key role technicians - and persons at the vocational level - can play in relations with industry in effective environmental management. In the funding of all education one has to see the long-term perspective rather than the short term, the wider economic gains rather than cost-per-student-place in a given year. Cost effectiveness, cost recovery and economic support can only be seen in this kind of framework. Environmental education is concerned with efficient use of resources, the conservation of resources, elimination of waste, the avoidance of costly mistakes whether they be by pollution or the abuse of natural resources.

Environmental education must be viewed as an integral part of technician and vocational education not as an added on unit in an already overcrowded curriculum. The curriculum has to be rewritten from an environmental perspective. We have to mould both technician teachers and technicians so that their attitude to environment is in-built in the same way that attitudes to cleanliness or other social behaviours are inculcated. Training should be such as to make abuse of the environment an unthinkable action. This applies at all levels. The technician in industry is the person most likely to be at the interface of industrial activity and the environment. He should be the first to be aware, for example, of environmental abuse, i.e. factory pollution or overuse of chemical fertilizers or the improper maintenance of machinery capable of causing pollution or injury. From factory floor tradesman to the technician in the most complex of laboratories there is need for training in sensitivity to environmental factor. Such training can be viewed as an economic or a social saving or a cost recovery factor.

A third issue, and one not unrelated to environmental education, is the need in our training to require quality. One of the factors which hits one most when visiting workshops and laboratories in many countries is the huge waste of human and material resources because of sloppy workmanship. All too often one sees bad maintenance, improper use of tools, inappropriate use of equipment combined with a picture of bored students sitting around in groups without any apparent direction from the teacher who himself does not seem to have any clear objective. Many workshops and classrooms I visit work at well below half of the level of efficiency possible and this constitutes one of the most costly ways of approaching technician education. I was alarmed on a visit to one country when speaking to a relatively newly appointed principal of an engineering institute to learn from him that his greatest achievement in the six months of his principalship was to raise attendance level of both teachers and students from a point where less than fifty percent of either attended in any one day. If you take it that in such an environment the teaching of the fifty percent present would probably be only fifty percent efficient the cost and the waste of resources are considerable. Taking the broad theme of Topic C the development of a strong sense of professionalism among teachers, college lecturers so that they become self motivated to produce the best possible technicians, who will also have a professional attitude to their work, is a cost-saving measure worth top priority.

Allied to this is the training of teachers in the use of appropriate technology. Reference is not made here to the kind of technology which is developed to meet the perceived special needs of a developing country - and there is a whole school of thought that wants to look backward rather than forward in this respect - but appropriate in the sense, in the first place, that teachers will use it and, in the second, that they are able and willing to maintain it. The most enduring and appropriate technologies have been the blackboard and the printed page. I have spent a lifetime in education and have seen many cycles of teaching technology particularly in the audio-visual fields. It has been good technology in that it would appear to make learning easier and teaching simpler but all too often it is unused or put out for display on open days; the teachers just do not use it. Similarly much money has been spent on very elaborate workshops and equipment with the same story of gross underutilization. Man is fascinated with machines but teachers have to face up to the fact of whether they are prepared to use them effectively and efficiently. A huge saving in time and money can be achieved by being realistic. Donor agencies will see their money better spent if they ensure that the software training component occurs first with machinery being given only where there is this prior existence.

The problem is easier to solve in retrospect. Currently personal computers look like being very appropriate teaching

tools and elsewhere I have supported their utilization, but having seen the fate of a succession of teaching machines which were its predecessors I wonder what the verdict will be when thousands of these machines will have been installed in classrooms.

Some forecasting on the basis of present and future environments are possible. Recently I visited a training school in a small town where small-scale fishing and coconut processing seemed to be the major economic activities. The teachers in the school were complaining of the age and worn-out state of their equipment, mainly small lathes. They were old and in need of replacement after many years of hard use. But, standing in the same room was a heavy metal milling machine of comparable age but in unused condition apart from the ravages of neglect. Its price in scrap iron alone would replace the lathes. Nobody seemed to have thought of this even though they were convinced that it would never be used. The point is, however, that at no stage in that town's history would there be use of that kind of heavy machinery: it was obviously inappropriate technology. Lest it be considered that people learn from mistakes of the past I also visited a marine and fisheries school in the same town. It has yet to take its first students but the white elephants - perhaps one should have white whales in such an environment - were already very apparent. Some donor agencies had contributed huge sums in inappropriate technology. Such costs and lost opportunity costs are a huge drain on educational resources.

This paper may have failed to address the issue the workshop organizers had in mind. Taking the broad field of technical teacher training it was suggested that the paper focus on cost effective training schemes which would cast the technical/vocational teacher in the role of change agent. Nothing new has been suggested; nothing which would cost more than is currently spent. Nor does the writer have alternative suggestions which would be more cost effective in achieving the objectives stated. There are alternative structures for carrying out teacher education. Some may be less expensive. There is a popular belief that distance education can be less costly than traditional forms. As in most things you get what you pay for and some distance education modes are, as stated in current costs, very cheap indeed; but in terms of effective graduates are extremely expensive and of doubtful use. The structure is indeed not the prime issue. Cost is not an independent variable; it is relative to what you want to achieve.

In the introduction I referred to the high investment costs, top flight universities and high technology firms are willing to pay for creativity. They see this as low in terms of their objectives. Most governments are not prepared to make such high levels of investment - at least in education - nor will they accept high levels of risk. They are also conservative forces rather than agents of change. It is therefore suggested that

there will be little new money to bring about the desired objectives of the workshop if radical new proposals are brought forward. Therefore, stress ought to be placed on what is possible within the existing structures and budgets. It would be difficult to justify additional new initiatives when the potential in the existing organizations is so high. The proposals which has been set down are, indeed, not much out of line with what we say we do, but far removed from what actually takes place.

Reference was made earlier to professionalism and to the need of quality. If a fixed cost is the overriding factor then training fewer people but training them better is the preferred way. There are too many Asian countries with too many poorly qualified graduates. They take up too much teacher resource. The teachers of these graduates are usually underqualified in terms of quality of education, often underpaid and generally themselves the product of the kind of education they provide. What money is available should be concentrated on producing leaders of high quality, a small cadre of excellence. Perhaps the most urgent need is for the staff development and retraining of technical teacher trainers, partly in newer pedagogical approaches but largely in inculcating a sense of professionalism so that the responsibility for ongoing development is accepted by the trainer and extended into developing similar attitudes in the student teachers. With regard to pedagogy this should be student centred - on their learning how to learn, -on the trainer's learning how to motivate students to learn and to think creatively. Change and the problems of change are human dimensions. Unless there is a grasp of the dynamics of change and an orientation to assuming a role as change agent the present static state will remain. Hence the staff development should be centred on human resource development techniques.

The well-trained professional person effects subtle but important changes in his environment throughout his working life. We train our doctors, architects, scientists and many other professionals in this way. My impression in the Asian region - but not confined to it - is that we generally fail to do this with teachers. There are other factors with Asian teachers, such as working conditions, which hinder professionalism but a basic positive attitude to professionalism is not present.

Part of the problem may lie with inadequate support. We have very little data on which educators in the region can work. Some research has been done in the area of manpower but little on man. In the Western countries a lot is known about what motivates their students, what determines their attitude to learning and to the world of work. Do we know anything about Asian students or is there an assumption that the findings of Western researchers are applicable in this region? I do suggest that there is need for research on the attitudes and behaviour patterns of our young adults in the region. The issue of how to

prepare them better for particular tasks can then be better addressed. The diversion of some funds in the research support units which many ministries have to collect soft data on students would seem a desirable step. Much of the data currently generated is statistical and historical and necessary though some of it might be, it will not help produce the right kind of technician for the twenty-first century.

We do not need to look at the twenty-first century to realize what difficulties those planning for technical education face. Technological change is so rapid and becomes dispersed to society so quickly. It is suggested that high technology with its solid state and micro-circuitry, with its in-built telemetric capabilities, with its stress on robotics, will possibly be serviced by persons requiring little technical training; that the kinds of skills and knowledge we now impart will be of little service to high technology industry. Such a state will come about at different times in different nations. At least for the potential technicians now in primary and secondary schools in developing regions, it would be safe to predict an immediate future need of a mixture of low technology, with its requirements of considerable numbers of technicians with high levels of skill, and high technology with a very small number of extremely specialist technicians and a large base of unskilled attendants. Our uncertainty about even ten years from now demonstrates this need for our technical workforce to not only be able to accommodate to change but also to anticipate it and help industry adapt to it. The training systems need this same level of adaptability in both what they offer and how they impart it.

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My credentials for the writing of this paper are not strong. I am not a software expert in the sense of the kind of personnel assembled to develop materials for such institutions as open universities. I have written such a module and have at times been a distance education student who has been the victim of poor software. I have also been the creator of what I see in retrospect as not very good modules for students in a university which offered both full time and distance education programmes.

There is an assumption in this paper that there is no need to cover the ground on such prior issues as instructional objectives or of testing procedures which must be linked with teaching software. The economic aspect of software production seems to be an overriding factor in Topic C presentations and so the alternatives in software will be examined largely from this stance.

Cost effectiveness can only be measured in relation to goals achieved. Goal achievement similarly cannot be measured in terms of the number of teaching modules produced. If so Asia could rest on its laurels since largely because of the predilection of UNESCO, the Colombo Plan Staff College and other international agencies for this kind of software the Asian continent already bears a sizeable weight of paper utilized in this form of software.

The test of cost effectiveness can only be in terms of the extent to which software is used by teachers and how effective it is in promoting learning on the part of students. The answers to this we do not know and so a good cost-saving project might relate to research on the software which has been produced and what effect and benefit it has had.

The Colombo Plan Staff College has one indicator of its own success in the production of teaching software. It has devoted a considerable part of its resources to the development of modules and other print material. This material is generally given away free to those professionals who seek it. The material is largely directed to the client group which is the focus of this workshop: technical teacher training. As Director of the College for the past two years the requests that have come to me

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for such materials would be well below twenty in an organization servicing seventeen education systems. When we recently, physically moved the College from Singapore to Manila truckloads of this paper were sent away to the recyclers.

This might have been that we over produced or that the quality of the software was poor - though I would be happy to defend it. It might have been because teachers and national systems are not yet prepared to accept software designed for a multinational client group even though the international agencies see this as the cost-effective answer to the production of good software. The reason for absence of interest might be because teachers, by long tradition, feel that they are masters in their classroom or that curriculum developers have a priority interest in holding their jobs and so it becomes essential for control of software to remain in their hands. Certainly I as a university teacher never felt that what materials were available on the open market ever met my particular requirement. I read widely and stole ideas from authors unashamedly but somehow I felt I had to leave my mark on the materials which went into the hands of my students.

In the Asian context where texts and materials are usually centrally prepared one would expect another phenomenon to be present. This is a very long period without changes in the use of coursework materials. The links between initiating ideas on new software, authority of an academic and financial nature, and the production of such materials are unclear and time consuming.

This essential conservatism, this strong desire to stay with what you yourself produced or used or what through long usage you have become familiar with explains the dismal history of a whole range of software and teaching aids - audio-visual materials, programmed learning packages and, I suspect, modules. Anyone connected with education over some years is familiar with the succession of new teaching materials and approaches. They arrive, they receive high praise, sometimes they are purchased and stored, sometimes they have a brief honeymoon period of usage while novelty remains and are then discarded. It is not a question of poor quality or of inadequate conceptual framework because they can be very good. In most educational institutions you can find cupboards full of such educational artifacts. The problem of insufficient utilization is the high hidden cost factor which must be faced.

Two questions need to be answered when assessing cost effectiveness and economic utilization of resources: Will teachers use them? Do they effectively promote student learning? If the answer is "yes" to both then high initial investment costs are justified; if it does not there can be no way of justifying cost however low, though remedial action might be possible and this will be referred to later. Software production is not an open-ended activity or a cheap activity.

Any software requires a high level of human input. Hence the need for some prior knowledge on utilization seems a necessary prerequisite to the production of any software.

The boundary between software and hardware is not clear and indeed both words carry different specific connotations from what the agenda for the workshop suggests. In the absence of clear boundaries it is suggested that the first type of software to be considered ought to be the teacher. In this case the teacher trainer. The well-trained teacher is the most effective and most cost effective software available. Initial training costs might appear high but this ignores the economic fact that a well trained professional teacher is self-renewing software. He never gets out of date because, as a professional, he ensures that he remains abreast of what is taking place both in his discipline area and in pedagogy. He has an active life of twenty-five to thirty years and so has an impact on many generations of students. He is capable of research and so of enhancing the knowledge bases on which technician education is based. Additionally in his teaching life he generates very low cost software which meets the day to day requirements of his students - a perpetual software production centre maintained by his efficiency in the use of libraries or attendance at conferences, industrial re-visits and other forms of self renewal. It pays to have a high initial investment in the training of such teachers and also some low on-going support to maintain enthusiasm for self renewal.

Teachers and bureaucrats keep making public statements about the costs of technician education being too high. Certainly poor technician education is expensive out of all proportion to its limited worth. What is the right level of expenditure for technician education and particularly for training the trainers of technicians? How is it determined in relation to other social services - to soldiers and the whole apparatus of defense systems that never fire a shot in anger, to maintaining prisoners or hospital patients who are the victims of socially induced disease caused by smoking or drinking or drugs? All the indicators are that well trained professional teachers are inexpensive by comparison and that public statements ought to forget the notion of high cost and start an insistence on provision of funds adequate to ensure high quality.

A second area of "software" relates to students. It is interesting that neither "student" nor "learning" appear in the prospectus of this workshop. This is not uncommon. The order of things - and particularly in this region - appears to be buildings and equipment with high priority, then curriculum next followed by teacher training. Information systems and other issues coming on line in various orders. The student is, however, the second half of the education equation. One should agree that he should be the first. The system exists to service him. If he does not learn, no matter how good the supporting

software is technically, whatever the cost is, it is prohibitive and a complete waste. The able but failed student, the ill-trained student is a major cost factor both direct and in terms of lost opportunity costs. There is a traditional implication that there is an automatic and positive conditioned response by students - whatever is put before them learning is automatically assumed to take place. Yet research on adolescents and young adults in Europe and North America have demonstrated very clearly how tenuous is the link between teaching and learning. All too often little learning or at best shallow learning takes place. We do not know if Asian students respond in the same way as their European and American brothers because of the general absence of research in this area. In the Western experience money spent on training students how to learn effectively and of training trainers in a better appreciation of the learning set of the young adult has led to both qualitative and quantitative improvements in a significant way. This is because a well trained student, like a well trained trainer has the capacity and the motivation for lifelong learning - a highly desirable asset for the technician facing fast industrial changes. It may be considered that teachers and students are outside the scope of a definition of software yet as they are both the highest cost and often the lowest yielding components, consideration of achieving more cost effectiveness must start with them.

Turning to more conventional definitions of software it is not proposed to look in detail at the total range. Rather the criteria of selection have included low cost, current usage and potential for more cost effective usage. There is no doubt, for example, that laser discs with their potential for almost limitless information storage and retrieval capacity are not high cost software on any criterion of value for money but other factors leave them out of consideration. The first is that information availability or scarcity is not a problem. There is a surfeit of information in more readily available forms which is not currently effectively utilized. A second point is that as a teaching machine it is one of a succession of such most of which, in spite of their undoubted quality, are not well used. Introduction to the region should therefore be consequent on a definite change of attitude on the part of the trainers in the more advanced of the countries in the region before it can be considered for wider use.

Present availability, low cost and current usage certainly apply to blackboard and chalk or whiteboard and pen so they must be regarded as major items of software. The blackboard or its equivalent has survived many generations of teachers and there appears to be no immediate likelihood of it going out of use. Nor should it since it is very useful in the processes of elucidating arguments, demonstrating processes and summarizing. Yet too often it is neglected, badly maintained and poorly used even though its maintenance is cheap and easy. Its use ought to be part of lesson preparation. In fact a blackboard plan is as

important as a lesson plan since it is a major visible component of a lesson; one which students are likely to retain far longer than the spoken word. Overhead projectors offer a mechanically advanced version of the blackboard but again are poorly used, with too much detail and unreadable writing. The full potential for using overlays is also rarely exploited and, in fact, this represents the only real advantage over use of a blackboard. All three - blackboard, whiteboard and overhead projector are simple, cheap, durable teaching software but effective usage cannot be assumed; teachers need specific and on-going training as well as supervised practice if good utilization is to be maintained.

Print is the most ubiquitous and durable software we have. This is its strength and its weakness. Probably it has been overused and our expectations of it are too high. Where photocopying of books and journals is readily available and cheap, there is a widespread student belief, perhaps 'faith' is a more appropriate word, that photocopied material stacked on a desk or carried under one's arm is the equivalent of knowledge in the brain. Regrettably for them there is as yet no process for the transformation to take place except through the students' eyes and with the active involvement of the brain. Similarly librarians and academics generally regard the presence of a good library as evidence of a good academic institution. Again there needs to be a human interaction with the books before such is a reality. My impression in travelling in the region is that libraries, including the Colombo Plan Staff College library, are more looked at than looked into. There are some sound reasons for this being so and as effective utilization of software is our theme this may warrant further consideration during the course of this workshop. Largely to date they remain a huge potential. If used well they provide the good teacher and the motivated student with opportunities to transport their thinking beyond the formal constraints of the classroom.

Two factors have to be recognized and addressed. Few countries in the region have any long tradition of the use of the printed word - at least among the levels of the populace from which our technicians come. Secondly, English is now the major language of science and technology writing. This is recognized in many countries in the region and, in these countries a high proportion of the volumes in the technical libraries are English language texts. There is also a fairly uniform response to my questions about the usefulness of these books in countries where English is, at best, a second language and in many a third. The uniform answer is that at the upper levels of the colleges the courses are taught in English. Unfortunately, if you have the bad habit of wandering through libraries and seeking out evidence of book utilization you will find minimal utilization both of the books in English and also of libraries generally. The standard of English used by the lecturers is also often very low so that what the student gleans from this ineffectual use of English in lectures and texts must necessarily be low.

This is not meant as an unkind comment; there is no reasonable justification for such people to be highly proficient in a foreign language; the writer would be among the heaviest of sinners in this regard. What we are looking at, however, is the production and utilization of inexpensive, cost effective software. Libraries can be the answer but strong remedial action needs to be taken. The simplest and most obvious is to translate the texts into the first language of the country. This is expensive and time consuming and only nations like the Soviet Union with its vast resources and its high emphasis on information retrieval seem to be willing to carry on such sustained programmes. In terms of technological advances the policy has paid off handsomely. An alternative is for local academics to analyze and synthesize the materials and to produce sets of texts in the local language for student use. This requires a good knowledge of English as well as content. It is done to some extent. I find, however, that the volumes of such lecture notes are surprisingly thin - of the order of sixty or so duplicated pages as the average size, and this causes doubts as to how courses of considerable complexity can be accommodated in these slim volumes of which, commonly there is but one per course. They are also usually poorly printed and presented. The third solution is that adopted already by some Asian countries and this is to make English a primary language of instruction beginning in the primary schools. There is no one right solution but the crucial issue is of more effective utilization of the library resource, which is at once expensive, because of escalating purchase costs, yet inexpensive because it can accommodate many student needs over a number of years. We must continue to recognize, however, that there is a limit to the effective shelf life of a high proportion of books.

A second point relating to libraries relates to student use. Libraries, as they become information centers utilizing a variety of information sources, are becoming very complex. In the West it has been found essential to train students in library usage, even at the post-graduate level. Like use of the blackboard library usage needs constant practice so library exercises need to be incorporated in each course so that usage over several courses and several years provides a familiarity which leads to automatic acceptance of the library as a tool.

Course notes are both popular and useful software. Much has been done in the region in the development of modular material and reference will be made to this later. My most sustained experience with course notes was as a university teacher in a community which provided services for both full-time and distance education students. For many years I had post-graduate classes where the ratio of full-time to distance students was of the order of 1:2 so much of the focus had to be on the preparation of materials for the off-campus student. As the students were persons already employed as teachers in universities and colleges and the courses were about effective

university and college teaching the students were very strong critics and so one learnt the difficulty and complexity of writing such material very early in one's career. When one student misinterprets course notes this can be put down to student stupidity but when five or six misinterpret the same material one is less willing to identify who is stupid.

Open universities with high student enrolments and the opportunity for recovering course material costs can and do employ teams of subject, graphics, curriculum and sometimes media specialists to produce very professional course materials. This approach has its strengths and weaknesses. One of the possibilities for addressing the problems of staffing the technical teacher training colleges which are opening in various countries in the region might be an open university providing good course materials as well as good teaching by the distance mode. Unlike some open universities already operating in the region one would hope for a student focus and a focus on the production on a cost-effective basis of quality graduates. This would necessarily require the highest of standards of faculty and course materials. The training of teachers, because of its multiplier effect and the need to be a model of what should be done, must stress quality in all things.

More importantly, all potential teachers need to be trained in the skills of writing course material and lecture notes, the preparation of illustrative material such as charts, and diagrams. Most teachers err on the side of too much detail, too much complexity, whereas the ideal is shortness and simplicity, utilizing simple illustrative material to give visual support to the ideas expressed. Sustained hands-on training experience is needed as part of a student's preparation for teaching. All materials, whether for open university or for classroom use need in-built self-destroying mechanisms so that the hard decision of determining obsolescence is not left to the author, particularly those authors who have invested a considerable part of themselves in the development of the materials.

As a pathway to quality the idea of Asia-wide texts has often been discussed. The potential market is immense; much basic educational training material seems to have sufficient common ground; the economies of scale and the chance to draw on the best available talents - all of these are very appealing, particularly to persons working in organizations with a multinational client group such as UNESCO, ILO or the Colombo Plan Staff College. Kits including a textbook, accompanying workbooks, books of associated readings and a teachers guide are seen as the four major components. In every aspect except one it is a highly desirable concept since it addresses the issues of quality and price very effectively. The one problem that has been referred to earlier is the question of "ownership". Good material exists but national education systems and individual

teachers, where they have such discretion, show little inclination to use them.

With materials of this kind produced by the Colombo Plan we have found that there is at least one major step beyond production of this material. The College has a set of excellent modules on training field researchers. Calls for copies have been few indeed. Our success, however, has been to run courses to teach the teachers how to use the modules. Once they have a stake in "ownership", in familiarity with the materials we consider a multiplier effect is more likely - and there seems to be some evidence of it.

This research trainer program is a set of modules and it constitutes one of a series of modular approaches adopted by the College. Training programs have been held for training module writers and continuing consultancies have been established with some countries to help in the production of modules as part of a sustained curriculum development. As with other types of software the relationship between investment in training of module writers and the production of good modules is self evident. There is also another point implied in the previous paragraph. This is the need to train teachers how to use the modules produced.

This review has suggested nothing new. It has premised that simple "software" which teachers have consistently used is the launching pad for future developments. Again there is no suggestion that new knowledge or new technology is needed to address the issues of the topic. It is suggested that an emphasis on training and re-training emphasizing quality will produce the most cost effective improvements in technical teacher training. Investment in high quality initial training with further recurring investment in re-training the trainers would seem to be the top priority.

Since "software" appears in the title of the topic let me make a final digression on the more specific current meaning of the word. This is as it relates to the computer. Of all the generations of teaching machines the personal and micro-computer would appear at this stage of development to have more chances of acceptance than its predecessors. As indicated earlier man seems to be in love with machines and is fascinated in the initial stages when novelty has attraction. Once further intellectual input is required, as for example, when its use requires departure from accustomed behaviour or when maintenance becomes a problem, in the past the story has been that interest dries up.

The micro-computer has some advantages over earlier machines in that there seems to be a greater level of readiness on the part of society to accept it. Computers have moved from awesome wonder machines that only the highly trained specialist could face to the point where, in many countries of the world they have become Christmas or birthday gifts for children.

Whereas in the past technology came from the top down - the expert trying to impress on the teacher the values of the machine, now the student is the computer user and the teacher in the position of chasing after the student in order to maintain his status. The student, using computers as game machines, comes with no fears of ignorance or feelings of lack of ease with the equipment. These have been factors which have inhibited older people in the use of such technology.

The other important revolution which sets computers apart is that, for the first time and on a very large scale, teachers and other computer users are willing to use other people's software. We have passed the stage where, a few years ago, the purchase of a computer implied the employment of a couple of programmers to write software according to the specific needs of the purchaser. The trend now is for purchase of off-the-shelf software and computer shops everywhere are crowded with people seeking out the latest on the market. This is a highly significant development which is completely at odds with the concept of "ownership" of one's teaching materials which was referred to earlier in this paper.

The apparently simple software is the outcome of intensive and expensive research and development; the age of the amateur, except in an interactive role has passed. All of this has come to receive wide acceptance and so the chances of its use seem high. Interactive software - and software here is referring to the floppy or hard disc - whereby the teacher can still have a measure of control over the academic content of a disc will give teachers a measure of participation and, what is likely, their participation will be structured within the boundaries of sound course design principles. One problem remains and in this history is repeating itself. This is that the hardware is here and fairly widely available even in some of the less developed countries; the human element, the development of adequate training programmes lags far behind. Success and full utilization will depend on effective training.

This is the second of two papers I have given. The overriding theme of both is that there is little if anything which is new which will address the financial issues posed in the agenda for the workshops. There is no magic new educational development which will lead more effectively to the achievement of desired goals than the potential of the technology we now have. The software - mostly human driven - the hardware and the conceptual bases to achieve the goals already exist. What has been the problem in the past has been the poor support given to the human component which is the overriding factor in the successful training of technical teacher trainers.

The Asian region has been ahead of many other parts of the world, including many advanced nations, in recognizing the need for effective technical teacher training. And it has also gone

well ahead of many countries in seeking support for the physical facilities to support such training. Yet there has been an uneven approach to the problem. Often, physical facilities are present but underutilized. Secondly, training money has been used disproportionately. There is merit in giving advanced training to relatively few people in Western institutions, people who might be regarded as resource persons and leaders on their return to their country. This must be matched, however, by providing adequate resources for training the great majority of teachers within the region or within their own countries. Too often the overseas qualified persons are able to opt out and get more remunerative employment outside the technical education system. Too often after their return they are swallowed up by their education system and their particular expertise underutilized. There are reserves of such people in several of the countries from whom much more can be expected than is sought at present.

The major area of need, however, is the local training of technician trainers. In several countries only minimal resources have been provided for the professional development of technical teacher training college staffs. Such colleges in several countries are at 40% or less of their establishment. The urgent needs, therefore, are to recognize the high investment return on the well-trained trainer and the disastrous consequences of inadequate support for the initial outlay. The urgent need is to provide sufficient resources both for upgrading of existing personnel and for the aggressive recruitment and training of new personnel so that a firm base for the technology pyramid can be established. Without it the rest of the structure, and particularly support for industry, will be ineffectual.